

THOMAS VERNON WOLLASTON AND THE MADEIRAN BUTTERFLY FAUNA—A RE-APPRAISAL

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Abstract. In 1847, the British entomologist T. V. Wollaston visited Madeira and commenced a study of the invertebrate fauna of that island. He returned several times and his work culminated in the publication of *Insecta Maderensia* in 1854. Two years later he published *On the Variation of Species with especial reference to the Insects*, a text which clearly anticipated *On the Origin of Species by means of Natural Selection* by his friend Charles Darwin. Although Wollaston made only a small collection of Madeiran butterflies, he is remembered by the endemic subspecies of *Pieris brassicae* L. that bears his name. The present authors visited Madeira on a number of occasions during the period May 1997–August 1998 to survey Lepidoptera in the Parque Ecológico do Funchal, part of a long-term project to provide information for a field guide to the Lepidoptera of the park. This paper is an extension of that survey and presents data on all the Madeiran butterflies.

INTRODUCTION

‘The island being resorted to by so many invalids,’ wrote Professor Henry Moseley, on visiting Madeira in 1872 (Moseley, 1880), ‘the cemetery forms a conspicuous feature in the scenery.’ With this statement the scene is set, for almost 150 years ago the young T. V. Wollaston (1822–1878) Fig. 1, an ailing consumptive of 25 summers, first set sail for Madeira in the hope that constant sunlight and an equable climate might result in a cure for his tuberculosis. However, the truth is that few such individuals survived long. In travelling south, Wollaston was merely following that long line of Victorian invalids despatched overseas by doctors who were, themselves, unable to offer any effective treatment. Indeed, there was little hope of a cure, for the days of definitive anti-tuberculous medication were yet to come, but Wollaston, initially at least, did rather well. He was so taken by the beauty of the island, the friendliness of its inhabitants and the startling mountain scenery, that he returned on a number of occasions. While there he seized every opportunity to further his interest in entomology, and three prolonged visits to that island, undertaken at different periods of the year, supplied the basis for the most important of his written works—the monumental *Insecta Maderensia* (1854). This quarto volume of 677 pages was illustrated with exquisite coloured drawings by Professor J. O. Westwood FRS, and describes Madeiran insects in minute detail together with other works (e.g. Wollaston, 1858) (Fig. 2).

All that happened a very long time ago, and since then a not inconsiderable number of other naturalists have also made their way to the North Atlantic Islands of Macaronesia and some of them have studied the butterfly fauna of Madeira. Indeed, for a country with less than 20 butterfly species Madeira would appear to have received a great deal of attention. Many of these later authors, however, wrote little more about the entomology of Madeira and its neighbouring islands, Porto Santo and the Ilhas do Desertas, than short annotated lists of the species recorded,

and as far as the Coleoptera were concerned, such papers have often turned out to be no more than extensions of Wollaston's original works. So, was Wollaston an important figure and, if so, what did he actually achieve?

WOLLASTON'S EARLY LIFE

Thomas Vernon Wollaston was born on 9 March, 1822, at Scotter, Lincolnshire, the youngest son of Major Wollaston of Shenton Hall, Nuneaton. He was directly related to both William Wollaston (1659–1724), author of the *Religion of Nature Delineated*, and Dr William Hyde Wollaston FRS (1766–1828), the celebrated chemist who first discovered the metallic elements rhodium and palladium. Educated at the Grammar School, Bury St Edmunds, and Jesus College, Cambridge, he took his BA in 1845, and his MA in 1849. It was while at Cambridge that Wollaston first developed an interest in entomology, stimulated by the teaching and example of his mentors, Professor C. C. Babington FRS and, in particular, the Revd Hamlet Clark (1823–1867) (Fig. 3), a fellow undergraduate, who was elected Vice President of the Entomological Society of London in 1864. During his early years at Cambridge, Wollaston, with Hamlet Clark and the Revd J. F. Dawson organized collecting trips to the fens and Suffolk breckland. In 1843, Wollaston published his first entomological paper—a short account of the beetles found near Launceston—and it appears that from then onwards he was to devote most of his life to a continuous study of entomology and natural history. Under the guidance of Professor Babington and Hamlet Clark, Wollaston was soon elected a Fellow of the Cambridge Philosophical Society and then, in 1847, to Fellowship of the Linnean Society. Although his main interest was in the Coleoptera, Wollaston studied many other orders of insects as well as making studies of the botany of Madeira and its land shells. At least two species of Lepidoptera are named after him. There is little doubt that Wollaston's work on the North Atlantic Islands did much to stimulate others who were interested in the various endemic forms that inhabited them. What he achieved was to make people think.

During his undergraduate days, Wollaston was opposed to the theory of evolution but later, as a friend of Charles Darwin, he came to accept that some forms which could hardly be regarded otherwise than as individual species might have a recognizable derivative origin. Wollaston admired Darwin for his accurate field observations, but his own observations convinced him that there was no evidence that one species ever evolved into another. He concluded that species were separately created according to some divine plan, the details of which could be elucidated by the study of natural history. He insisted that his thesis stemmed not from religious belief but from observation and application of the inductive scientific method (Cook, 1995). In 1856, he published *On the Variation of Species with especial reference to the Insects*, a text which clearly anticipated Darwin's *The Origin of Species by means of Natural Selection* (1859).

Wollaston dedicated the work to his friend: "Whose researches, in various parts of the world, have added so much to our knowledge of Zoological geography." Darwin, in turn, sent him a complimentary copy of the *Origin of Species*. In spite of their conflicting views Wollaston and Darwin remained good friends, although the former's criticism of *The Origin of Species* clearly strained the relationship. Wollaston was quite unable to accept the central theme of Darwin's message (Anon, 1860). "A cold shuddering comes over us at what we are compelled to regard as a glorious *non sequitur*, and that, too, from premises which we cannot admit!" Darwin responded to this in a letter to his son William: "There was a rather fierce attack on it in Annals of

Nat. History by my friend Wollaston. . . . By Jove the Book has made row enough, & I shd [sic] now like to get on quietly with my work." Although Darwin would rather not have become involved he was provoked into retaliation. In July 1860, he wrote to Professor Westwood, who was attempting to raise money to purchase Wollaston's collections of Madeiran land and freshwater shells: "I have spent so much money lately that I am not willing to subscribe for the purchase of Wollaston's collections for your Museum." (Burkhardt, *et al.* 1993).

In the introductions to his various works on the fauna of the Atlantic islands Wollaston put forward his own hypothesis that the endemic Coleoptera could not be satisfactorily referred to any geographical area now existing, but rather to some Atlantic region of which they were the sole representatives of modern times. This view remained unchallenged until the latter half of the present century when a number of authors, including Mayr (1969), Bush (1975 and 1982), and Cain (1984), individually addressed the twin problems of evolution and speciation. More recently, Owen and Smith (1993a), who visited the North Atlantic Islands on a number of occasions, reviewed more than 300 publications on the butterfly fauna of Macaronesia, and postulated that this fauna consisted of four elements: a.) endemic taxa related to existing ones on the neighbouring continents; b.) relict endemic descendants of an extinct Saharan fauna; c.) recent (mostly post-fourteenth century) immigrants from Europe and East Africa; d.) cosmopolitan migrants. They suggested that an unknown but substantial number of species, mainly from Laurisilva which covered much of the island of Madeira, had probably become extinct since the islands were colonized by Europeans in the fourteenth century. They were able to show that the number of species and the number of endemic forms on each of the North Atlantic Islands were positively correlated with vegetation density and negatively correlated with distance from the nearest continent.

WOLLASTON IN MADEIRA

Two years after graduation, during the autumn of 1847, Wollaston developed early symptoms of severe pulmonary disease. His doctors advised him to seek a milder climate from the harsh British winter months ahead—advice that led him to convalesce in Madeira during the winter of 1847–1848. It was here that over the next few years, in spite of appalling ill health, he took every possible opportunity to study the entomology and natural history of the island. The result was the accumulation of a massive collection of Coleoptera, Lepidoptera and other orders of insects, as well as the first scientific collection of Madeiran land shells. On his return to England, Wollaston agreed to continue convalescence but this time in the West Country. He left his elegant town house in Park Lane, London; purchased property in Devon; married the youngest daughter of a close friend; wrote a slim volume of poems—*Lyra Devonensis* (1868); only to die a few years later, at the age of 57, of pulmonary haemorrhage, the consequence of tuberculosis. He was buried at Teignmouth, Devon.

Madeira was not the only island that Wollaston visited. He seemed fascinated by islands, and visited, among others, the Canaries, the Cape Verdes, St Helena and Lundy. At each place he collected assiduously, his illness permitting, and produced detailed lists of species which included many that were new to science. In St Helena he specialized in the Cossonidae (Coleoptera), collecting from that island no less than 54 separate species, and this interest ultimately led to the description of 255 new cossonid species—world-wide—which was approximately 180 more than all other coleopterists had achieved. Looking back to those far off times one is immediately struck by the strength of purpose that Wollaston showed while engaged in these

studies. His illness was at times so severe that he suffered an almost unremitting battle to keep going. He once wrote "The constant warfare between physical incapacity and will was a curious feature, even at Madeira, where half my work was actually written in bed, and when suffering more or less from bleeding of the lungs; or else while sitting in a chair in the garden, basking in the sunshine." But Wollaston was obviously made of stern stuff. In the preface to *Insecta Maderensia* he wrote, "In May of 1850, . . . having procured a tent, I again set sail for the island,—prepared to take up my abode, during the hotter period, in districts as yet but imperfectly explored; and by applying myself in good earnest (at elevations, moreover, difficult of access except at that peculiar season), I conceived that I should be in a position, at the close of my third sojourn, to attempt a more lengthened and systematic treatise than I had at the beginning ventured to contemplate".

During the 1850s, the expatriate community in Funchal was sizeable, (averaging around 500 adults in the summer months and 700 in winter (Nash, 1990), and Wollaston found within it a number of devoted friends. One of these, John Gray, a wealthy business man and amateur coleopterist, invited him to join his yacht, the *Miranda*, for excursions to remote parts of the island, and later to the Canaries archipelago and Cape Verde Islands. Among his companions on these trips was Richard Thomas Lowe, another Cambridge man and Chaplain to the English Church in Funchal. Revd Lowe was a keen naturalist, particularly interested in botany as well as the Mollusca. Unfortunately his practice of attempting to convert expatriate parishioners to the ways of the Roman Church led him into deep waters. When news of these heretic practices came to the ears of parliament, Lord Palmerston was provoked to announce that there was a 'scandal in Madeira.' He dispatched an envoy, the Archbishop of Cape Town, to Funchal at once, hoping that mediation might put an end to these 'vile practices.' The Archbishop, however, failed in his mission and Palmerston ordered Lowe's immediate resignation, an order that Lowe just as quickly rejected. Through all this Wollaston continued to support Lowe and, together, they organized further collecting trips to remote and inaccessible parts of the island. We wonder if the Archbishop of Cape Town was persuaded to develop an interest in the natural history of Madeira.

Wollaston was totally captivated by the beauty of Madeira although, in 1854, journeys to the more central parts of the island must have been extremely difficult. Travel on horseback, tramping for hours over ill-defined rocky tracks into the evergreen Laurisilva, or attempting to land on the more remote parts of the coastline were all fraught with danger, especially to a man so physically unfit but Wollaston revelled in the challenge and readily accepted the difficulties that beset him along the way. He may well have been mindful of the words of Charles Kingsley (1819–1875), a fellow naturalist and author of *The Water Babies*—indeed, these two would appear to have had much in common. "The naturalist," wrote Kingsley, should be "strong in body; able to haul a dredge, climb a rock, turn a boulder, walk all day, uncertain where he shall eat or rest; ready to face sun and rain, wind and frost, and to eat or drink thankfully anything, however coarse or meagre . . ." On his trips, Wollaston was usually accompanied by his wife, a knowledgeable lepidopterist, and Portuguese porters who were responsible for bringing daily supplies. He was able to describe in glowing terms the joys of camping out in wildest Madeira. "There is something amazingly luxurious in betaking oneself to Tent-life, after months of confinement and annoyance (it may be entirely,—*partially* it must be) in the heat and noise of Funchal. We are then perhaps more than ever open to the favourable impressions of an alpine existence;—and who can adequately tell the ecstasy of a first encampment on these invigorating hills! To turn out, morning after morning, in the solemn

stillness of aerial forests,—where not a sound is heard, save ever and anon a woodman's axe in some far-off tributary ravine, or a stray bird hymning forth its matin song to the ascending sun; to feel the cool influence of the early dawn on the upward sward, and to mark the thin clouds of fleecy snow uniting gradually into a solid bank,—affording glimpses the while, as they join and separate, of the fair creation stretched out beneath; to smell the damp, cold vapour rising from the deep defiles around us, where vegetation is still rampant on primaevial rocks and new generations of trees are springing up, untouched by man, from the decaying carcasses of the old ones; to listen in the still, calm evening air to the humming of the insect world (the most active tenants of these elevated tracts); and to mark, as the daylight wanes, the unnumbered orbs of night stealing one by one on to the wide arch of heaven, as brilliant as they were on the first evening of their birth;—are the lofty enjoyments, all, which the intellectual mind can grasp in these transcendent heights.'

In 1890, Mrs Wollaston presented George Baker with the greater part of her late husband's collection of Madeiran Lepidoptera. It contained 11 butterfly species and a much larger number of moths. Wollaston's original account (1858) consists of little more than short descriptive paragraphs, in Latin, of the various species, but Baker (1891) transcribed these, added notes of his own, and put forward his own theory that humidity of climate might be largely responsible for variation in certain species (see also Stainton, 1859).

From July 20–August 3, 1998, the authors visited Madeira under the auspices of the Madeiran scientific funding body—CITMA—to survey Lepidoptera in the Parque Ecológico do Funchal. This was part of a long-term project started in May 1997, to provide information for a field guide to the Lepidoptera of the Park, and to provide base-line information against which the effects of the attempted re-establishment of native vegetation (*Laurisilva*) on the butterfly fauna could be assessed (Wakeham-Dawson & Warren, 1998a). We were accompanied by entomological colleagues from the Natural History Museum (London) and the University of Warwick. The authorities of the Parque Ecológico do Funchal put the Casa do Barreiro (970 m.), one of the park houses used to accommodate visitors, at our disposal and we were able to visit most parts of the island to examine localities mentioned as specific in the literature. Although the butterflies of Madeira are well documented, a number of changes, some highly significant, have occurred during the past thirty years. It is with this in mind that we have re-examined the status of the butterfly fauna as it appeared on this visit, and in relation to Madeira's Oceanic existence (MacArthur & Wilson, 1967).

The Funchal Ecological Park

The Parque Ecológico do Funchal was founded in 1994 as a centre for environmental education. It is situated above Funchal, the capital city of Madeira, on the southern side of the island (Fig. 4). The Park covers an area of about 10 km²; its lowest point is 500 m. above sea level and it rises to over 1800 m. near Pico de Arreiro. The range of elevation together with a number of steep gullies within the Park, allows the area to support an interesting assemblage of endemic plants and animals (Wakeham-Dawson & Warren, 1998b).

One of the main aims of the Park authorities is to fell invasive *Eucalyptus* and *Acacia*, and replace them with Laurel trees. The hope is that native Laurel forest (*Laurisilva*) can be re-established. *Laurisilva* once covered most of Madeira and is a relic of the forests that covered southern Europe in the Tertiary Period (Press & Short, 1994). From sea-level (especially on the dry south side of the island) to c. 300 m. there



Fig. 1. Thomas Vernon Wollaston (1822–78).

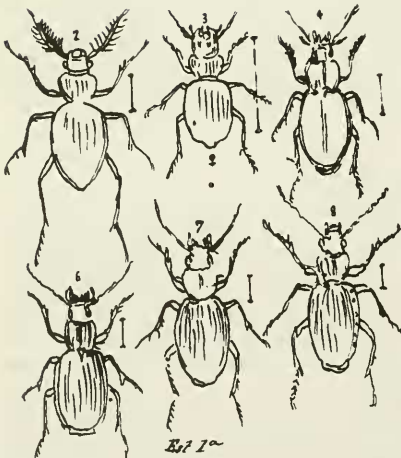


Fig. 2. Beetles sketched by T. V. Wollaston 1846. (Courtesy Mun. Museu Funchal).



Fig. 3. Revd Hamlet Clark (1823–67).

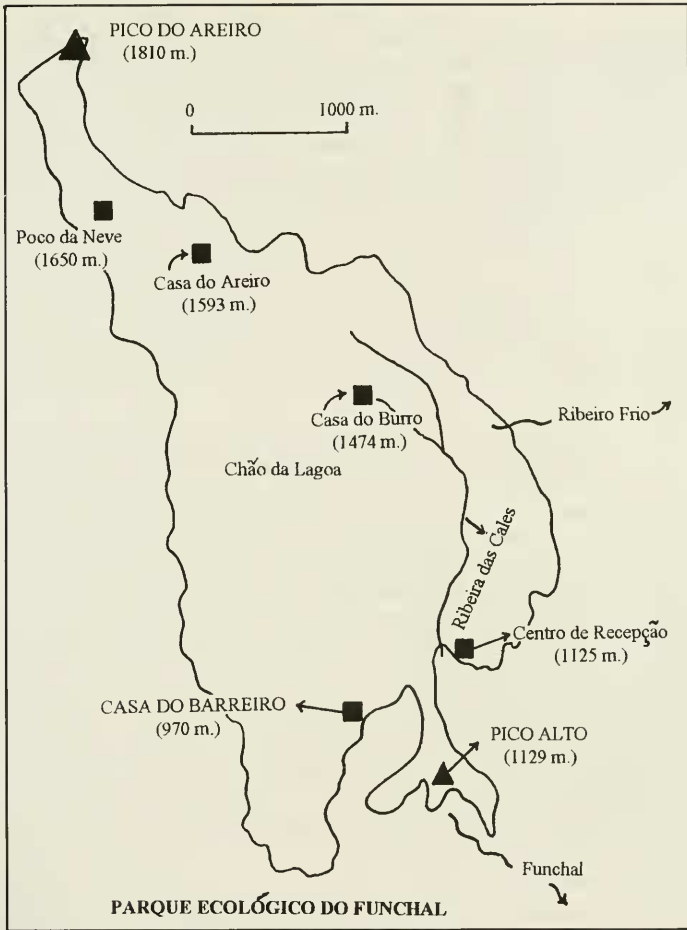


Fig. 4. Map of the Funchal Ecological Park (Parque Ecológico do Funchal).

was dry Laurisilva consisting of *Apollonias barbuiana* (Cav.) Bornm. with *Euphorbia* spp. and Dragon trees (*Dracaena draco* (L.) L.). From 300 m. to about 1200 m.: humid Laurisilva of *Laurus azorica* (Seub.) Franco, etc., and from 1200 m. to the summit of the island: *Erica* spp. (Tree Heathers) Laurisilva. Today, the scene is rather different. The humid Laurisilva is now restricted to the north and the dry Laurisilva is now almost totally replaced by urban development or agriculture (Press & Short, 1994). The humid Laurisilva is kept wet by condensation of water from the frequent sea fogs that form over the higher regions of the island. Much of the original area of Laurisilva on Madeira has been destroyed, and the Park's project may make a valuable contribution to the conservation of this important habitat type. According to Nash (1990) João Gonçalves Zarco, the Portuguese explorer who discovered Madeira in 1419, found the island covered with dense forest (in Portuguese, the word Madeira means wood). In order to clear the ground for the first settlement he caused fire to be put to the trees. There is a local legend that the whole of the island burned for seven years but this is probably no more than a legend.

CHECK-LIST OF THE MADEIRAN BUTTERFLIES
(arranged in the order that they are discussed below)

- Pieris rapae* (L.) small white.
Pieris brassicae ssp. *wollastoni* Butler. madeiran large white. (W) Endemic subspecies.
Gonepteryx maderensis Felder madeiran brimstone. (W) Endemic species
Colias crocea (Geoffroy) clouded yellow. (W)
Hipparchia maderensis Baker. madeiran southern grayling. (W) Endemic species.
Pararge xiphia Fab. madeiran speckled wood. (W) Endemic species.
Pararge aegeria (L.) speckled wood
Neohipparchia statilinus (Hufnagel) tree grayling. (US)
Vanessa atalanta (L.) red admiral. (W)
Vanessa indica ssp. *vulcania* Godart. indian red admiral. (W)
Danaus plexippus (L.) monarch or milkweed butterfly.
Cynthia cardui (L.) painted lady. (W)
Lycæna phlaeas ssp. *phlaeoides* Staudinger. small copper. (W)
Lampides boeticus (L.) long-tailed blue. (W)
Colias hyale (L.) pale clouded yellow. (US)
Cynthia virginensis (Drury). american painted lady. (US)
Issoria lathonia (L.). queen of spain fritillary. (W) (OS)
Hypolimnas misippus (L.) false plain tiger. (US)
Danaus chrysippus (L.) plain tiger. (US)

W = specimens in the T.V.Wollaston Collection (1847–1850)

OS = occasional vagrant

US = uncertain status

Pieris rapae (L.)

The small white is a relatively recent addition to the Madeiran fauna. Although there is the record 'of a possible sighting' in 1909 (Swash & Askew, 1982), it was not until December 1971 that a specimen was actually captured and not until 1974 that the species became definitely established. In July of that year a massive invasion occurred which Wolff (1975) suggested might have originated in Portugal and been driven by the prevailing Trade Wind towards Madeira. Why, Wolff asks, when similar climatic conditions must have occurred many times in the past, did sudden colonization not

occur until 1974? This question has not been answered. We found the Small White to be very common throughout the Parque Ecológico do Funchal (Table 1) and at the northern end of the island, inland from Seixal, and in the wooded laurel-covered valleys near Rabaçal. It could be seen flying from sea-level to an altitude of at least 1300 m. It is also common on the island of Porto Santo. We observed females ovipositing on Cabbage (*Brassica oleracea* L.) and Chagas (*Tropaeolum majus* L.) during July and August 1998. It has also been observed in Madeira laying on *Coronopus didymus* (L.) Sm. (Wakeham-Dawson, 1998). No named aberrations were observed.

Pieris brassicae ssp. *wollastoni* Butler

Since Wollaston first collected this butterfly in mid-Victorian times—and he collected a considerable series (Baker, 1891)—it has continued to decline in numbers and must now be regarded as extinct. This decline appears to be long-standing. Both Wollaston and Baker thought this subspecies was little more than a melanic variation of *Pieris brassicae* L., forming a natural transition between *P. brassicae* and the endemic Canary Island *P. cheiranthi* Hübner. Felder (1862), who published a list of the insects collected by scientific members of the frigate *Novara*, thought that this subspecies was *P. cheiranthi*, but Kudrna (1973), after critical examination of the genitalia of *P. brassicae*, *cheiranthi* and *wollastoni*, stated that there was sufficient evidence to consider *wollastoni* as a subspecies of *P. brassicae*. The male genitalia are illustrated in Fig. 5a, for comparison with illustrations by Higgins (1975).

Swash & Askew (1982) pose the question as to whether the decline in numbers of *Pieris brassicae* ssp. *wollastoni* and the increase in *P. rapae* might be inter-related; the decline of the former facilitating colonization by the latter, and the establishment of *P. rapae* possibly resulting in the final decline of *P. brassicae wollastoni*. This seems unlikely, however, as both taxa co-exist throughout much of Europe. It therefore remains a subject for debate. Another possibility is that a parasite arrived on the island and destroyed the *P. brassicae wollastoni* population. In the United Kingdom 95% of *P. brassicae* larvae are parasitized by the wasp *Apanteles glomeratus* L., and the population only survives because of the regular influx of migrants from the Continent (Cribb, 1983).

Although Martin (1941) found *P. brassicae wollastoni* at Santo da Serra, Oehmig (1977) at Pico Arreiro and Aguas Mensas, and Gardner & Classey (1960) at Rabaçal. Chão das Feiteiras and Caramujo, de Worms (1964) observed only a single specimen in 1964, at Monte, c. 700 m. above Funchal. Since then there have been only scattered sightings. Wolff (1975) reported a number of specimens in 1973 and 1974, and Swash & Askew (1982), various isolated sightings at Porto da Cruz, Ribeiro Frio, Funchal and Santa Cruz. They concluded that 'the only sizeable population located was in the valley leading to Fajã da Nogueira where, in July and August, several specimens were seen near the river and a few at greater altitude up to about 1000 m.' Two years later, Lace & Jones (1984) reported seeing the Large White at Boca da Risco on the north coast, but Owen and Smith (1993a), who visited the island five times during the 1990s, were unable to find either adults or larvae. One of the present authors (A.W.D.), in six visits to Madeira since 1997, has been no more successful. In an extensive search during July 1998 we found no evidence that this butterfly still flies on Madeira. Resident entomologists have not seen this species in recent years and have been aware of a decline in *P. brassicae wollastoni* that appears to have matched the increase in *P. rapae* (Antonio M. F. Aguiar, pers. comm.).

Gonepteryx maderensis Felder

This species (Plate I, H), well known to Wollaston in the 1850s, is endemic to Madeira and formerly widely distributed and abundant. It was first described by Felder (1862) who thought it was no more than a variety of *G. cleopatra* L. Some thirty years later, Baker (1891) suggested that it formed a connecting link between the Mediterranean *Gonepteryx cleopatra* L. and *Gonepteryx cleopatra* ssp. *cleobule* from the Canaries. More recently, Kudrna (1975) has accorded both it and *cleobule* specific status. This action is supported by Brunton *et al.* (1996) who studied seven species of *Gonepteryx* under ultraviolet light to reveal their ultraviolet reflectance patterns. They were able to show that *G. maderensis* differed from other species in that the ultraviolet pattern on the underside of female specimens was typical of *Gonepteryx* males.

The literature suggests that over the past 25 years the madeiran cleopatra has declined steadily in numbers. Kudrna (1975) described *G. maderensis* as local and uncommon at higher elevations in mountains; Gardner & Classey (1960) thought it might be restricted to certain northern parts of the island; while Swash & Askew (1982) reported sightings at Fajã do Cedro Gordo, near Fajã da Nogueira, and the Botanical Gardens at Ribeiro Frio. Manley & Allcard (1970) found this species at an altitude of 1200 m. However, the Madeiran Cleopatra may in fact be more common than it appears, as it rarely comes down from the forest canopy. It is probably widespread but not common in March, May and July in areas of Laurisilva between 400–1000 m. In July 1998 we observed small numbers flying about the laurel forest at Chão da Ribeiro. This species was seen at Chão da Ribeiro near Seixal on the north coast in March (John Smit, *pers. comm.*) and again in May (W), and a female was seen ovipositing high up in the Laurisilva canopy on leaves of *Rhamnus glandulosa* Aiton on 24.vii.1998. A male was observed nectaring at *Hypochoeris radicata* L., and both sexes were observed feeding at *Agapanthus praecox* Willd. flowers by the roadside near Ribeiro Frio and at several locations near the Encumeada Pass. A single male was seen in the Funchal Ecological Park on 30.vii.1998 (Table 1). This butterfly had probably flown south west from Ribeiro Frio with the prevailing wind (Duarte Câmara, *pers. comm.*). This is encouraging because it suggests that the species may be able to re-colonise naturally in the Park, once Laurisilva is established. The male genitalia are illustrated in Fig. 5b.

Colias crocea (Geoffroy)

In July and August 1998, the Clouded Yellow was second only to the Madeiran Southern Grayling in abundance. It occurred at all altitudes from sea-level up to 1800 m. and was often observed flying in the streets and gardens of Funchal. A female was observed laying single eggs on the upper surface of the leaves of *Trifolium repens* L. in shaded areas near small cabbage fields at Seixal. We also noticed that a

PLATE I MADEIRAN BUTTERFLIES

| | | |
|---|---|---|
| A | B | C |
| D | F | G |
| E | | |
| H | I | J |
| K | L | M |
| N | O | P |

A: *Hipparchia maderensis* Male. B: *Hipparchia maderensis* Female. C: *Hipparchia maderensis* Female underside. D: *Pararge aegeria* Male. E: *Pararge aegeria* Male Dwarf Var. F: *Pararge xiphia* Female. G: *Pararge xiphia* Female underside. H: *Gonepteryx maderensis* Male. I: *Lycaena phlaeas* ssp. *phlaeoides* var. *caeruleopunctata*. J: *Vanessa indica vulcania*. K: *Colias crocea* var. *cremonae*. L: *Colias crocea* var. *dawsoni*. M: *Colias crocea* var. *geisleri*. N: *Colias crocea* var. *radiata*. O: *Colias crocea* male Dwarf var. P: *Colias crocea* var. *faillae*.



wings closed if the passing butterfly was a male or a mated female. Unmated females were pursued by several males and some pairs were observed mating in flight. Males were also observed drinking from wet mud. Oviposition was not observed. In July and August 1998, this was the most abundant butterfly on the island, with the sexes in approximately equal numbers. It was common in open grassy areas and pine woods above 1000 m. in the Park and other similar habitats across the island. It was also present in *Erica*-rich Laurisilva at Rabaçal below 600 m. Previously, Kudrna (1997) reported it at 1700 m. on Pico do Arieiro and at 1000 m. on Eira do Serrado, while Swash & Askew (1982) found it to be common between Pico do Arieiro and Pico Ruivo, and beside the track from Pico Ruivo to about halfway to Encumeada. They concluded that it was the most abundant butterfly at altitudes in excess of 1600 m.

Pararge xiphia Fab.

The madeiran speckled wood (Plate 1, F & G) is endemic to Madeira. In 1891, Mrs Wollaston reported it to be 'one of the commonest species in Madeira at intermediate elevations, and wasted examples may be found throughout the winter, especially in the district above Funchal, called "the Mount."' [Monte] (Baker, 1891). It is of interest to recall that the district known as Monte was much favoured by expatriate Britons and invalids seeking homes on the island. More recently, Swash & Askew (1982) found this species to be common near Portela and in the Ribeiro Frio-Fajã do Nogueira region, but absent at low altitudes and near the coast. Although *P. xiphia* is widely distributed and common above 500 m., it is most abundant in Laurisilva—and in this habitat can even be found flying when low clouds shroud the landscape in dense fog.

In July 1998 we found *P. xiphia* to be abundant in the Parque Ecológico do Funchal, especially along the edge of woodlands, where it flew in company with the european speckled wood (*P. aegeria* (L.)). Males were seen perching on bracken (*Pteridium aquilinum* (L.) Kuhn) fronds, or trees in the Laurisilva, waiting for females to approach. A number of males were also seen engaging in vertical spiral flights with other males intruding upon their territories. The resident male would usually return to its original perch once the intruder had been driven off. These spiral flights were similar to, but not so prolonged as those of *P. aegeria*. Females appeared extremely selective about where they would lay their eggs: flying into dark excluded places and often testing a potential food-plant with their ovipositor, but not depositing an egg. However, females were observed ovipositing in shaded areas of the Laurisilva forest on *Brachypodium sylvaticum* (Huds.) and *Poa trivialis* L. (especially dead leaves at the base of tussocks) at Fajã da Nogueira, Ribeiro Frio and Portela during July and August, 1998. One female was seen positioning a single egg on the underside of a dead fern (pteridophyte) frond above a levada (man-made watercourse). The eggs were very pale green, smooth to the naked eye, and about twice the size of *P. aegeria* ova laid on *Poa* sp. in southern England. The male genitalia are illustrated in Fig. 5c.

Pararge aegeria (L.).

The first Madeiran specimen of the european speckled wood was captured at Ribeiro Frio in 1976, by N. D. Riley (Higgins, 1977), since when it has become widely distributed (Plate 1, D & E) and abundant through much of the island from sea-level to about 1000 m. (Owen & Smith, 1994). It may, however, be absent from the Ilhas do Desertas and Porto Santo. In July and August, 1998, we found it to be quite common in the Parque Ecológico do Funchal, especially in wooded areas where

the scattered vegetation was interspersed by patches of dappled sunlight. It is widely distributed in gardens and *Eucalyptus* forest, especially below 1000 m., and it is less common in Laurisilva. A dwarf male specimen was taken in which the wingspan measured 30 mm. (average wingspan for males = 46–50 mm.). As with *P. xiphia* we observed males performing vertical spiral flights. Although a female was observed apparently searching for suitable egg-laying locations near clumps of *Poa trivialis* L. in a shaded area near a levada at Rabaçal, oviposition was not seen.

Neohipparchia statilinus (Hufnagel)

The tree grayling has been recorded from Madeira on one occasion. In the Zoological Museum of the University of Copenhagen there is a single specimen labelled: Madeira, Nogueira, Camara de Cargo, 1000 m., 23.viii.1974, E.Traugott-Olsen leg. (Karsholt, 1988). This was examined by Lionel Higgins who stated it to be of the form *allionia* (Fab.). As no other specimens have been recorded it may have been a misplaced specimen, although Karsholt suggests that the single specimen was probably a vagrant from the Iberian peninsula where the form *allionia* occurs (Higgins & Hargreaves, 1983).

Vanessa atalanta (L.)

The red admiral has probably never been a common species on Madeira. We saw no evidence of it in the Park during July and August 1998 but we did see worn specimens in the Botanical Gardens during this period. The three specimens in the Wollaston collection were taken in company with *V. indica* at Monte, above Funchal (Baker, 1891). More recently the species has been recorded from Pico das Pedras in April and Fajã da Nogueira during July by Swash & Askew (1982), who also found it sparingly on Deserta Grande (Ilhas do Desertas) and Porto Santo.

Vanessa indica vulcania Godart (= *occidentalis* Felder)

The Indian red admiral (Plate 1, J), which Owen & Smith (1993b) reported as well-established and common on Madeira, indeed more abundant than *V. atalanta*, is perhaps most often seen during April and May. It has been recorded from Machico, Santa Cruz, Santo de Serra, Porto da Cruz, Faial and São Jorge (Swash & Askew, 1982) as well as the botanical gardens at Ribeiro Frio. We observed a single specimen at Rabaçal in July 1998. The occurrence of this butterfly on Madeira, however, constitutes an enigma.

Field (1971) showed that of five separate subspecies of *V. indica*, four were restricted to South or East Asia, while *V. indica* ssp. *vulcania* Godart was confined to Macaronesia in general and Madeira and the Canary Islands in particular. Why should the Macaronesian populations be separated from the other subspecies by thousands of miles? The distribution of *Vanessa indica*, worldwide, has been discussed in considerable detail by Leestmans (1978) and Shapiro (1992). Leestmans was able to examine 40 examples of *V. indica* and *V. indica vulcania* from the Belgian National Collection and a further 12 *V. indica vulcania* from his own collection. *V. vulcania* appeared to be phenotypically constant and Leestmans suggested that it deserved full specific status on account of significant differences in the structure of the genitalia between it and Asian *V. indica*.

So how did *V. indica vulcania* first reach Macaronesia? Three possibilities have been suggested. (1) *V. indica vulcania* may have evolved from specimens accidentally introduced from India by early Portuguese traders. (2) It may have migrated to

Macaronesia from Asia, although there is little evidence that this butterfly is migratory. (3) It may be a relict, now endemic to Madeira and the Canaries, from the time when Laurisilva covered much of southern Europe (Tertiary Period).

Shapiro (1992) suggests that although the traditional view has been that Portuguese traders 'introduced' the butterfly during the past 500 years, this is unlikely to be correct. The phenotypic characters of *V. indica vulcania* from Macaronesia are just not consistent with a relatively recent introduction from the Portuguese trading centres in southern India or Sri Lanka. From an examination of biogeography and ecology Shapiro suggests that it is not possible to rule out an autochthonous origin as a relict of the once wide-spread Tertiary broad-leaved forests preserved in Macaronesia as Laurisilva. He goes on to add, 'The very different time scales of the two hypotheses [500 years or several million years] suggest that genomic comparisons would allow easy discrimination between them.' It is likely that future DNA analysis will provide a more accurate indication of this Macaronesian butterfly's ancestry.

V. indica vulcania has also been recorded from the neighbouring island of Porto Santo, where a century earlier, Alfred Russel Wallace (1889) quoting Wollaston, stated that specimens invariably tended to be smaller than those found on Madeira. Manley & Allcard (1970) noted that Stichel (in Seitz, 1906) also described Madeiran specimens of this species as being smaller and darker than those from the Canary Islands, but were unable to substantiate this. It is possible therefore that Stichel was referring to specimens from Porto Santo. In the Canary Islands the foodplant is *Urtica morifolia* Poir, where it occurs abundantly as a component of the ground flora of laurel forests (Owen & Smith, 1993b). However, *U. morifolia* is an uncommon plant on Madeira (Press & Short, 1994), where Manley and Allcard (1970) state that the larvae feed on *U. dioica* L.

Danaus plexippus (L.)

The monarch is not uncommon in the streets of Funchal, the botanical gardens at Ribeiro Frio, and a number of areas below 1000 m. on the warmer south side of the island. Occasional specimens were seen in the Parque Ecológico do Funchal during July and August 1998 (Table 1). Owen & Smith (1989) have shown that the Monarch tends to select introduced species of *Asclepias* such as *A. curassavica* L. or *A. fruticosa* L. to lay its eggs on rather than native species. This would probably account for its being seen most frequently in Funchal gardens where these ornamental plants are grown.

Cynthia cardui (L.)

Most authors suggest that *C. cardui* is seen frequently on Madeira but, during July and August 1998, we observed two specimens only in the Parque Ecológico do Funchal. Antonio M. F. Aguiar (*pers. comm.*) has evidence that this species breeds in Madeira as well as appearing as a regular migrant.

Lycena phlaeas ssp. *phlaeoides* Staudinger

The small copper is represented on Madeira by the subspecies *phlaeoides* Staudinger. The fore-wing markings are darker than in the nominotypical form, with some enlargement of the submarginal spots. In extreme examples the copper band of the hindwings is reduced in size and sometimes almost obliterated. The underside is characterized by a band of grey scaling in the outer discal area. The

small copper is common in all habitat types in the Parque Ecológico do Funchal, even at altitudes of 1500 m., where it flies in the moorland gullies. We observed it also at Rabaçal in July 1998. It has also been recorded from Acada do Cedro Gordo, Balcoes, near Camacha and between Pico Ruivo and Encumeada (Swash & Askew, 1982). There is considerable variation in Madeiran specimens. In 1891, Baker recorded pale specimens, while Cockerell (1923) commented that a specimen from Porto da Cruz was 'ordinary *phlaeas*, not dark at all.' In July 1998 we captured a number of extremely dark examples—undoubtedly *L. phlaeas* ssp. *phlaeoides*—in the Parque Ecológico do Funchal which included the following named forms:

f. *caeruleopunctata* Ruhl, several specimens of this common aberration were observed, although none of these was extreme (Plate 1, I). In no case were there more than four pale blue submarginal spots to the hindwings.

f. *obsoleta* Tutt, a single specimen was observed in which the copper band on the hindwings was absent.

f. *radiata* Tutt, a single specimen in which the copper marginal band on the hindwings was divided into wedge-shaped rays.

Lampides boeticus (L.)

The long-tailed blue appears to be common and widely distributed on Madeira up to an altitude of about 1200 m. Females were observed laying on *Genista tenera* (Jacq. ex Murray) near Seixal; *Lupinus albus* L. (grown as a crop) near Encumeada; *Lotus pedunculatus* Cav. in the Fajã da Nogueira, and *Cytisus scoparius* (L.) Link at a number of locations during July and August, 1998. See also Wakeham-Dawson (1998).

Colias hyale (L.)

This species is strongly migratory and Cockerell (1923) records that Malcolm Burr had seen specimens in the collection at the Seminário in Funchal. No details of these are known and it is presumed that they originated from Spain or the Mediterranean Islands.

Cynthia virginiensis (Drury)

Godman (1870) mentions the american painted lady from Madeira but, curiously, not from the Canary Islands where it has been regularly recorded. It is possible that he confused the two island masses as no further records have been reported. Although Higgins & Riley (1970) included this record from Madeira, it has been omitted from the more recent editions.

Issoria lathonia (L.)

Although the queen of spain fritillary has been recorded from Madeira on a number of occasions—indeed, Baker (1891) described it as abundant—its appearance would appear to be dependent upon migration from Portugal, North Africa or even the Canary Islands. The Municipal Museum at Funchal has two specimens (nos. 1910 and 1911), but these carry no collection data.

Hypolimnas misippus (L.)

As with *Colias hyale*, Malcolm Burr is reported by Cockerell (1923) to have seen specimens of the false plain tiger in a collection at the Seminário in Funchal. It is not known whether these specimens still exist, or details as to the localities and dates of

their capture. In the Municipal Museum at Funchal there is a single specimen that was taken at Quinta Fé, Funchal, 12/11/1950.

Danaus chrysippus (L.)

There is a single reputedly Madeiran specimen (No. 23907) in the C. H. C. Pickering's Collection at the Funchal Natural History Museum. Unfortunately the specimen carries no other data. It is possible that this butterfly migrated from the mainland of Africa, or the Canary Islands (a distance of approximately 300 miles), where it occurs on Tenerife, Palma and Gomera.

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SHORT COMMUNICATION

***Catharosia pygmaea* (Fallén) (Diptera: Tachinidae): a second record in Essex—** Whilst sorting through some pan-trap material collected by Peter Harvey during surveys of Rainham marsh, Essex, and passed to me by Colin Plant, I came across a very distinctive tachinid which was unfamiliar to me. It failed to key in Belshaw (1993) but keyed readily to the genus *Catharosia* in McAlpine (1987). Reference to the excellent tachinid bibliography on the website <http://res.agr.ca/ecorc/isbi/biocont/biblio.htm> compiled by James E. O'Hara disclosed that Falk (1998) had added this species to the British list from a ruderal site in Warwickshire. Falk's paper enabled me to confirm the description that the Rainham specimen was the same species. The single male specimen was captured at the eastern end of the old silt lagoons on Rainham marsh, TQ5279, between the 25. viii. and the 6.ix.1998. The pan trap was set by Peter Harvey amongst flower-rich ruderal vegetation. My thanks go to Peter Harvey for permission to publish this note.—D. A. SMITH, 12 Tring Gardens, Harold Hill, Romford, Essex RM3 9EP.

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AGGREGATION OF OVER ONE MILLION 16-SPOT LADYBIRDS IN A BRAMBLE HEDGE, AND "BLUSHING" IN TWO SPECIMENS

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Abstract.—An unusual aggregation of the 16-spot ladybird, *Tytthaspis sedecimpunctata* (L.) is described, in which over 1 million individuals might have been involved. Among them were individuals of a red–orange form.

INTRODUCTION

The 16-spot ladybird, *Tytthaspis sedecimpunctata* (L.), is well known for its overwintering aggregations, and although it is not in the same league as some New World coccinellids which congregate by the bushel, it is regularly found in clusters of several hundreds. Occasionally, overwintering masses number in their thousands and in his recent *New Naturalist* volume, Majerus (1994: Plate 10f) makes a point of illustrating a Suffolk gorse bush where upwards of 30,000 individuals of this species have been known to overwinter.

I have often found a handful, perhaps a few score, of 16-spots gathered together during very early spring—at the base of a fence-post, or against a grass tussock—but I was amazed to discover a bramble hedge in which I estimated over one million individuals were sheltering.

OVERWINTERING AGGREGATIONS

On 22.iv.1998, whilst carrying out an ecological survey of Woodlands Farm, near Bexley in Kent (TQ450768), I noticed several accumulations of the 16-spot ladybird in a bramble hedge. Initial curiosity became incredulity as it soon became apparent that the accumulations were very many and very extensive.

The long bramble hedge (Fig. 1) ran along the top of a large open field that had once been arable, but which had lain fallow for several years. It was exposed and rather windswept, but was south-facing and warm in the spring sunshine. The bramble growth arose slowly and obliquely from the grass edges of the field, with a shallow sloping border rather than the abrupt bulging form characteristic of many blackberry bushes.

Examination showed that this shallow hedge edge had a fringing band about half a metre wide which was about 10 to 20 cm deep. This low edge was dotted with a vast number of clusters of 16-spot ladybirds. They were huddled together on leaves (Fig. 2) and also on the stems, particularly where one stem crossed another (Fig. 3).

A quick estimate showed that there was a group of ladybirds every 10 or 20 cm in each direction across the shallow half-metre border. Clumps ranged from 10 to maybe 150 individuals. I carried out a rough count over a few metres and estimated at least 200 ladybirds per linear 10 cm along the hedge. After walking the half-kilometre field boundary to confirm that the ladybirds were indeed gathered along its entire length, I calculated that it appeared to house at least one million individuals.

The year 1997 was very dry and warm, and judging from the numbers of 16-spot ladybirds in the hedge, this species had a very good season. The hedge in which they were overwintering ran in a zigzag along the northerly edge of the field and, at least on the day of the field visit, the prevailing wind was southerly, directly off the field and onto the hedge. It is tempting to suggest that the beetles lived out in the field



Fig. 1. The half-kilometre bramble hedge running along the top of a large field. It slopes up very gently from the grass of the meadow.

Figs 2-4. *T. sedecimpunctata* aggregations.

Fig. 2. Accumulation of about 50 overwintering on a bramble leaf. They closely matched the patches of dead leaf in their beige coloration.

Fig. 3. Accumulation of about 35 overwintering on a bramble stem. Their pale colour equally closely matched the buff of the woody stems.

Fig. 4. Single reddish form, one of two specimens found in the hedge, amidst normal 16-spot ladybirds overwintering.

during the summer and that the bramble boundary was the logical place for the overwintering ladybirds to end up.

I was rather surprised to find ladybirds still congregated in overwintering masses in late April, but later discovered (M. Majerus, *pers. comm.*) that because it is a mildew feeder, the 16-spot often does not become active until later in the year than other species. Also the previous fortnight had been very cold and wet. When I revisited the site on 13.v.1998, there was no sign of the ladybird congregations, and only a very few specimens in the sweep net as I searched the nearby edges of the field.

“BLUSHING”

The largest of the clusters that I noticed contained about 150 ladybirds, but there were also many groups of 5 to 10 and also singletons walking about on the bramble. Despite the notionally strong black and beige patterns of the beetles, they were nevertheless quite cryptic, camouflaged against the mottled and slightly faded leaves, and blending in well with the drab beige of the bramble stems. In the 50 or so groups that I examined closely I kept a keen look-out for any dark specimens, knowing that this species does very rarely have melanic forms. None was found, but, amongst the